

REMARKS

By the present amendment and response, claims 11 and 18-19 have been amended to overcome the Examiner's objections and claims 12-13 and 17 have been canceled. Thus, claims 11, 14-16, and 18-19 remain in the present application. Reconsideration and allowance of pending claims 11, 14-16, and 18-19 in view of the claim amendments and the following remarks are requested.

The Examiner has rejected claims 11-16 under 35 USC 102(b) as being anticipated by U.S. patent 5,355,283 to Marrs et al ("Marrs"). The Examiner has further rejected claims 17-19 under 35 USC 103(a) as being unpatentable over Marrs in view of U.S. patent 5,825,628 to Garbelli et al ("Garbelli"). For the reasons discussed below, Applicant respectfully submits that the present invention, as defined by amended independent claim 11, is patentably distinguishable over Marrs, Garbelli, or any combination thereof.

Initially, applicant notes that the present invention is directed to securing a mold compound to a printed circuit board. The problem of securing a mold compound to a printed circuit board had not been, prior to the present invention, resolved in the art. As Figure 1 of the present application illustrates, when the printed circuit board is subjected to heat, vapor 32 results in an upward force 34 on mold compound 12. Upward force 34 in turn results in delamination in die-attach 48 and a resulting separation between semiconductor die 16 and die-attach area 18. Semiconductor die 16 in turn forces mold compound 12 to separate from metal layer 36. Bond wire 28 is detached from printed

circuit board bonding location 30 as a result of mold compound 12 separating from metal layer 36. The detaching of bond wire 28 results in an electrical open and consequent failure of the integrated circuit.

Marrs and Garbelli do not, singly or in combination, address or resolve the problem of securing a mold compound to a printed circuit board. Moreover, Marrs and Garbelli do not, singly or in combination, teach, disclose or suggest the features claimed in amended independent claim 11 of the present application. Marrs is directed to a ball grid array that is purportedly less expensive and smaller than previous ball grid arrays. According to Marrs, vias are formed within the substrate of the ball grid array package to create a shorter path between the bond pads on the chip and the solder ball pads of the ball grid array package. See, for example, Marrs, column 3, lines 51-54. According to Marrs, the vias so formed aid in making a smaller ball grid array package that has a higher interconnection density and a greater electrical speed than previous ball grid arrays. See, for example, Marrs, column 4, lines 8-11.

However, Marrs expressly states that its vias are a replacement to through holes in previous ball grid array packages since, according to Marrs, vias result in a higher interconnection density as compared to through holes. See, for example, Marrs, column 4, lines 11-13. Indeed, Marrs intends to overcome “through holes 107” shown in “Prior Art” Figure 1 of Marrs. See, for example, Marrs, column 2, lines 37-57 and Figure 1. Moreover, Marrs is not directed to a printed circuit board having a metal layer on the top surface of the printed circuit board and another metal layer on the bottom surface of the

printed circuit board. Further, as explained above, Marrs teaches away from making a through hole through a substrate, a printed circuit board and, *a fortiori*, Marrs teaches away from making a through hole in the top and bottom metal layers of a printed circuit board. Further, Marrs is not directed to securing a mold compound to a substrate or to a printed circuit board. All of the above mentioned distinctions are claimed in amended independent claim 11 and as such amended independent claim 11 is patentably distinguishable over Marrs.

The Examiner has stated that conductive pad 140 in Figure 1 and column 4, lines 42-48, of Garbelli discloses a layer of metal below the die and, as such, Garbelli makes claims 17-19 of the present application obvious. Applicant respectfully submits that amended independent claim 11 is distinguishable over Garbelli. First, the present invention, as defined by amended independent claim 11 requires a through hole traversing the first and second layers of metal in a printed circuit board. Second, amended independent claim 11 requires two layers of metal, one on the top surface of the printed circuit board and below the die and another on the bottom surface of the printed circuit board.

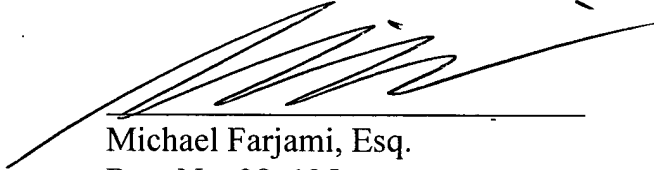
Third, and more fundamentally, conductive pad 140 is a well known pad below a semiconductor die in a semiconductor package such as BGA package 100 in Garbelli. Conductive pad 140 in Garbelli is not meant to be, and is not required to be, holding down mold compound 160. In fact, as seen in Figure 1 of Garbelli, conductive pad 140 is barely in contact with mold compound 160. However, as Figure 1 of the present

application illustrates, mold compound 12 is in contact with a large area of metal layer 36. And as seen in Figure 1 of the present application, in the absence of the present invention, due to upward force of vapor 32, mold compound 12 can be delaminated from the surface of metal layer 36 though, ideally, metal layer 36 should keep mold compound 12 intact with the printed circuit board. In other words, one achievement of the present invention is to hold down the mold compound and prevent it from being delaminated from the plane of the metal layer on the top surface of the printed circuit board. For the foregoing reasons, Applicant respectfully submits that the present invention as defined by amended independent claim 11 is not suggested, disclosed, or taught by Garbelli, either singly, or in combination with Marrs.

For all the foregoing reasons, the present invention as defined by amended independent claim 11 is patentably distinguishable over Marrs, Garbelli, or any combination thereof. As such, dependent claims 14-16 and 18-19 are also patentably distinguishable over Marrs, Garbelli, or any combination thereof. Thus, Applicant respectfully request an early allowance of claims 11, 14-16, and 18-19 pending in the present application.

Respectfully Submitted,
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